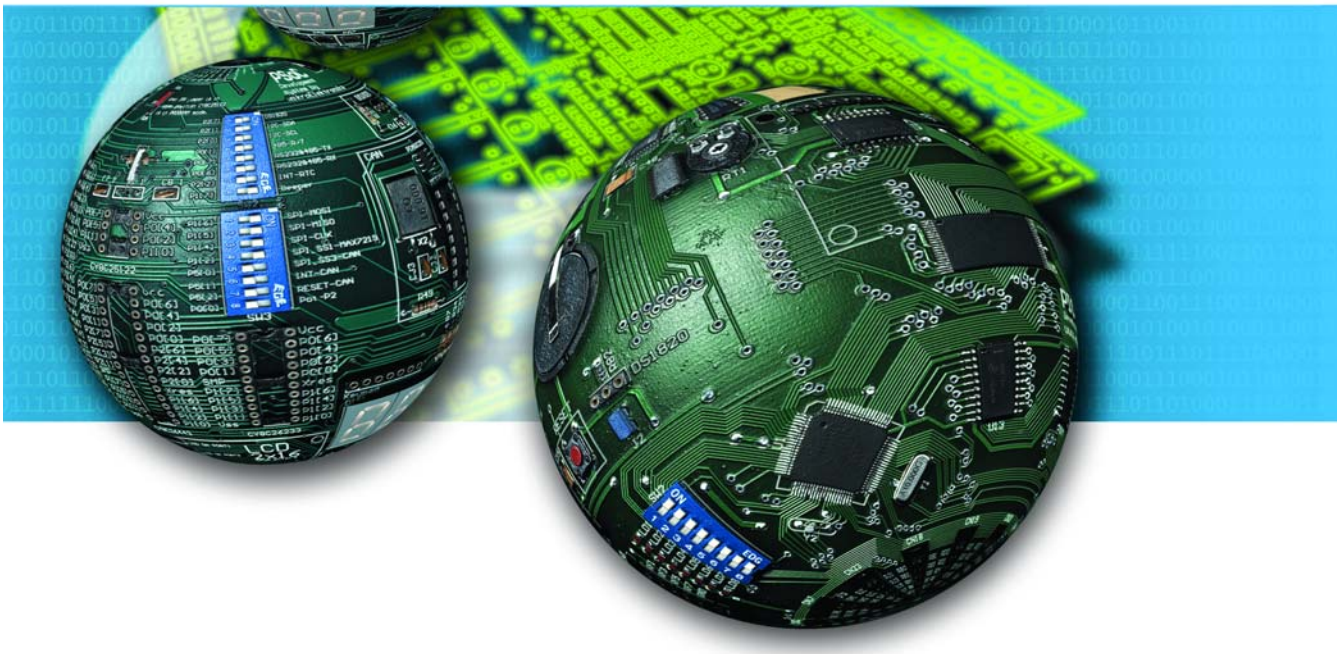
MikroElektronika
Development tools - Books - Compilers

mikroICD
User's Manual



mikroICD is highly effective tool for Real-Time debugging on hardware level. mikroICD debugger enables you to execute a program on host PIC microcontroller and view variable values, Special Function Registers (SFR), memory and EEPROM as the program is running. In this simple tutorial, we will create a new project, write some code, compile it, and test the results with mikroICD. Our project will write "mikroElektronika" on LCD, so it can be easily tested on any PIC.

Software and Hardware
solutions for Embedded World

mikroICD (In-Circuit Debugger)

Software and Hardware

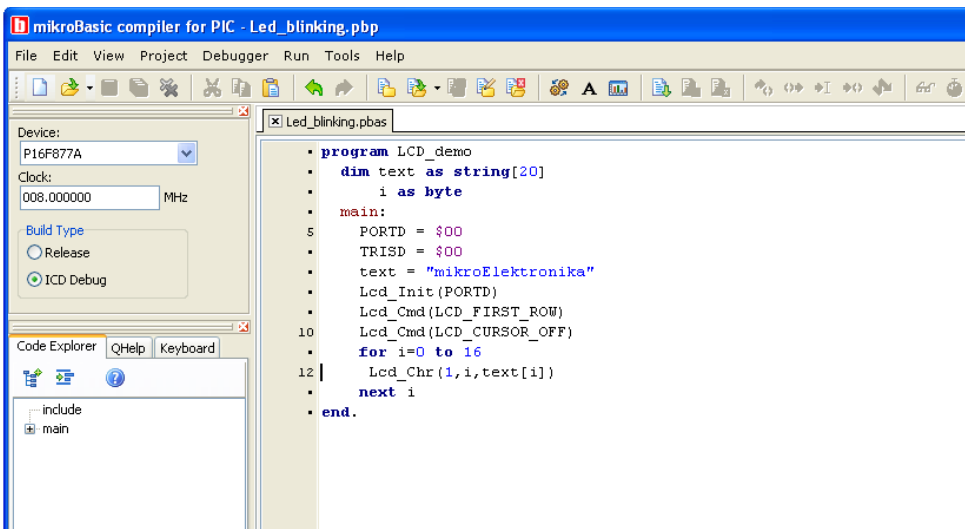
Before using mikroICD check that you have appropriate development board or programmer for using mikroICD (such as EasyPIC4, BigPIC4, PICPLC8A, PicFlash with mikro ICD support etc.). For more info on mikroICD hardware checkout our website **http://www.mikroe.com/**. Also, you must have mikroC/mikroPascal compiler v6.0 or mikroBasic compiler v5.0 or later installed on your computer for using mikro ICD.

NOTE: RB6 and RB7 pins cannot be used as I/O pins while mikroICD is active. mikroICD uses those pins for its communication.

NOTE: PICFlash programmer software v7.02 or later must be installed on your computer for using mikroICD.

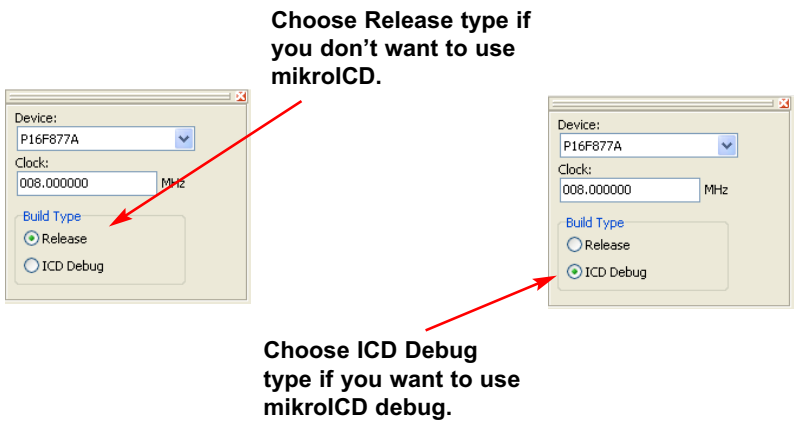
STEP 01:
Write program

First of all, you should create new project and write your program.



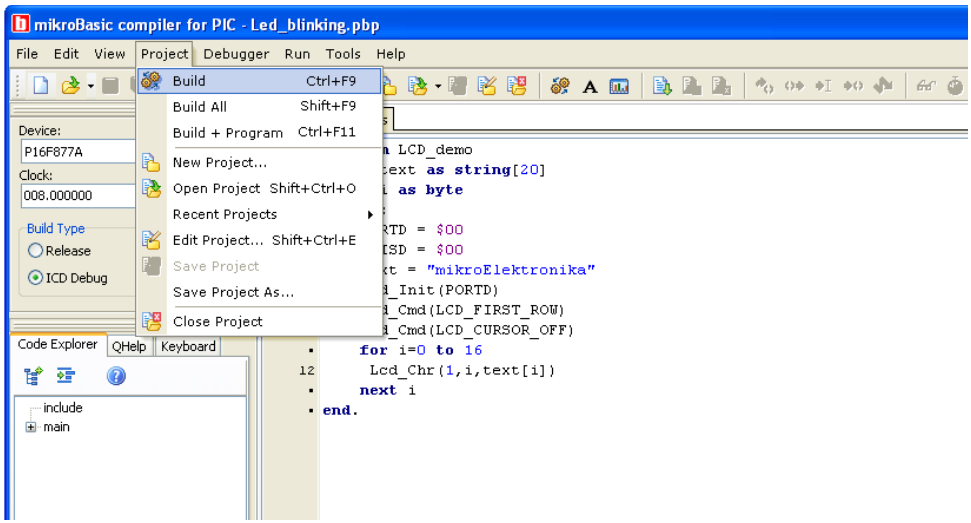
STEP 02:
Seting up your project for ICD Debug

In order to setup your project for using mikroICD you have to choose **ICD Debug** build type in the Project Setup window.



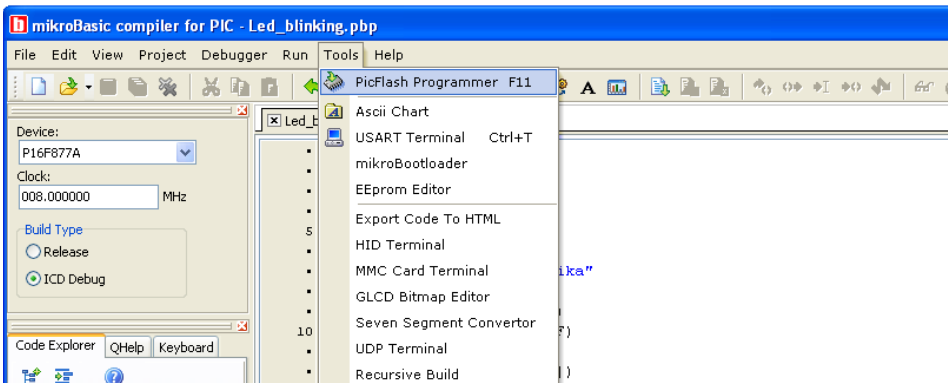
STEP 03:
Compiling your project

Now it's time to compile your project. Press **CTRL+F9** or by selecting **Project > Build** from the drop-down menu.

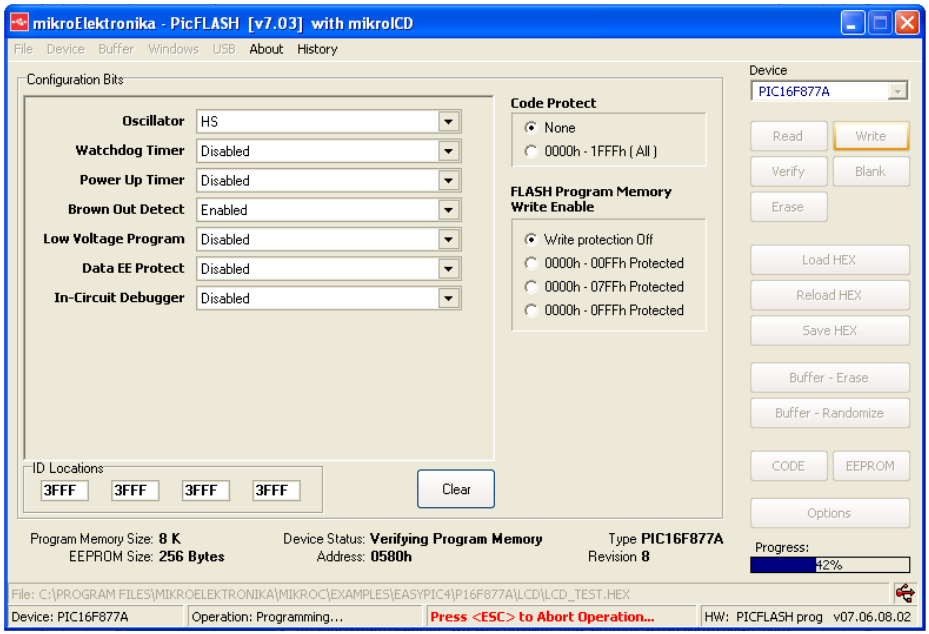


STEP 04:
Writing program to MCU

After successful compilation of your project it's time to write your program to PIC microcontroller. You can do that by pressing **F11** or by selecting **Tools > PicFlash Programmer** from the drop-down menu.



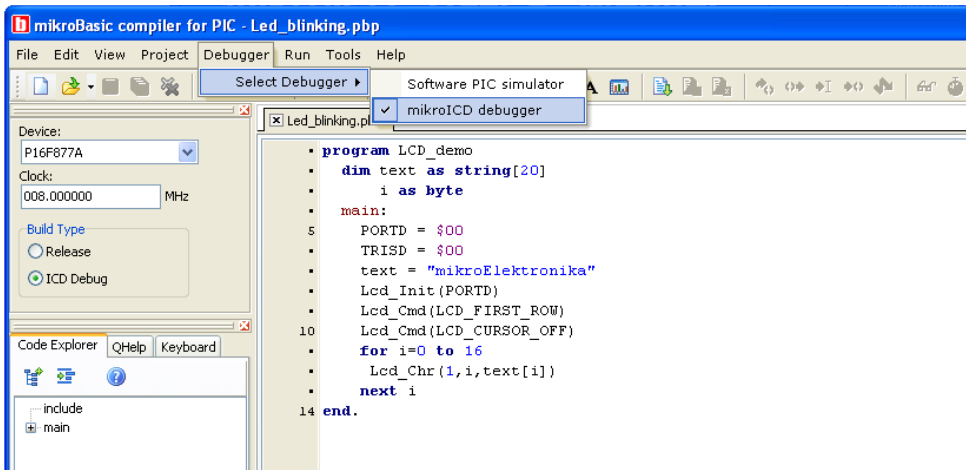
After pressing **F11** or by selecting **Tools > PicFlash Programmer** from the drop-down menu, the PicFLASH 2 Programmer software should appear and automatically program PIC microcontroler.



After successful programming you can check if PIC is programmed for mikroICD debugging, by verifying that RB7 LED (EasyPIC4 development board) is turned on.

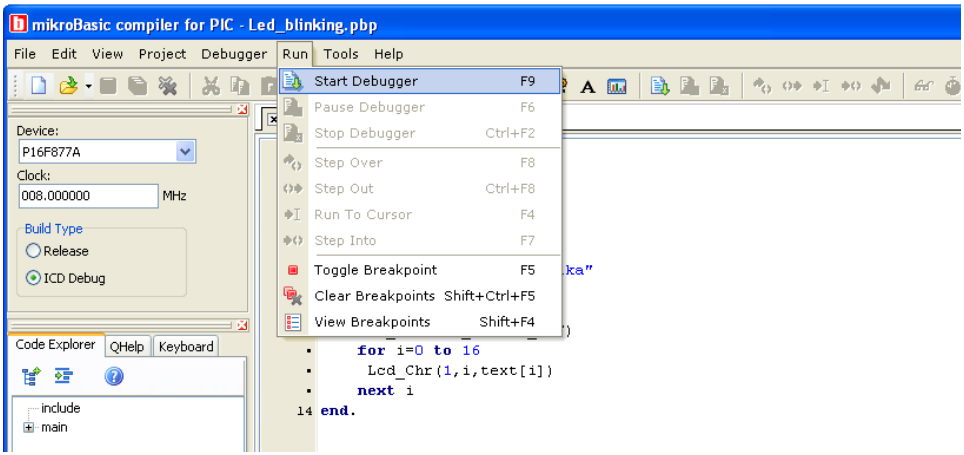
STEP 05:
Selecting mikroICD Debugger

After successful PIC programming you have to select mikroICD by selecting **Debugger › Select Debugger › mikroICD Debugger** from the drop-down menu.



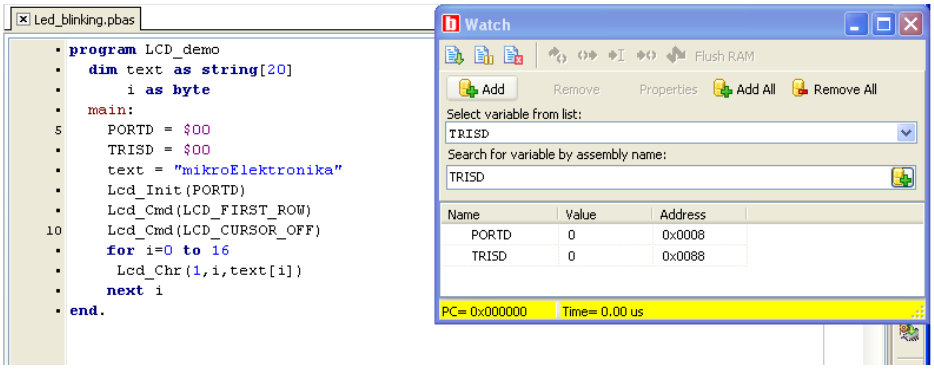
STEP 06:
Running mikroICD Debugger

You can run the mikroICD by selecting **Run › Start Debugger** from the drop-down menu, or by clicking Debug Icon.



Starting the mikroICD makes more options available: Step Into, Step Over, Run to Cursor, Step Out. Line that is to be executed is color highlighted (blue by default). There is also notification about program execution and it can be found on Watch Window (yellow status bar).

NOTE: Some functions take time to execute, so running the program is indicated on Watch Window by highlighting status bar in yellow.



mikro ICD Debugger Options

mikroICD has several integrated options. You can use this options manually or via function keys. mikroICD options are summarized in the table below:

Name	Description	Function Key
Debug	Starts Debugger.	[F9]
Run/ Pause Debugger	Run or pause Debugger.	[F6]
Toggle Breakpoints	Toggle breakpoint at the current cursor position. To view all the breakpoints, select Run › View Breakpoints from the drop-down menu. Double clicking an item in window list locates the breakpoint.	[F5]
Run to cursor	Execute all instructions between the current instruction and the cursor position.	[F4]
Step Into	Execute the current C / Pascal / Basic (single– or multi–cycle) instruction, then halt. If the instruction is a routine call, enter the routine and halt at the first instruction following the call.	[F7]
Step Over	Execute the current C / Pascal / Basic (single– or multi–cycle) instruction, then halt. If the instruction is a routine call, preform the call and halt at the first instruction following the call.	[F8]
Flush RAM	Flushes current PIC RAM. All RAM memory values will be changed according to values in the watch window.	N/A
Step Out	Executes program until first return	[CTRL]+[F8]

mikroICD Debugger Practical Example

STEP 01:
Writing example program

Here is a step by step mikroICD Debugger Example. First of all, you have to write a program. We will show how mikroICD works using a simple example written in mikroBasic compiler:

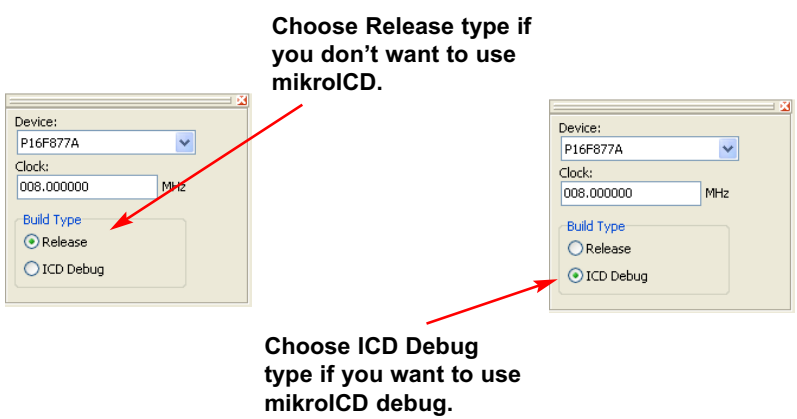
```
program LCD_demo

  dim text as string[ 20]
       i as byte

  main:
     PORTD = $00
     TRISD = $00
     text = "mikroElektronika"
     Lcd_Init(PORTD)
     Lcd_Cmd(LCD_FIRST_ROW)
     Lcd_Cmd(LCD_CURSOR_OFF)
     for i=0 to 16
      Lcd_Chr(1,i,text[ i] )
     next i
end.
```

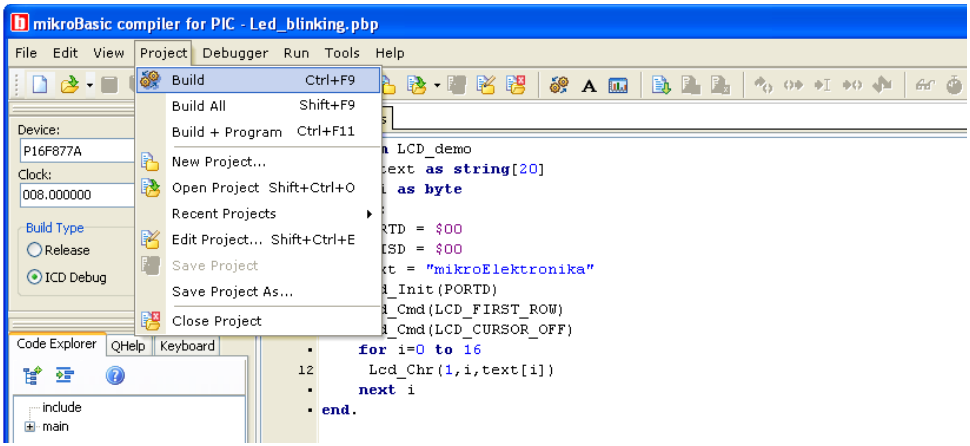
STEP 02:
Setting up your project for ICD Debug

In order to setup your project for using mikroICD (In-Circuit Debugger) you have to choose **ICD Debug** build type in Project Setup window.



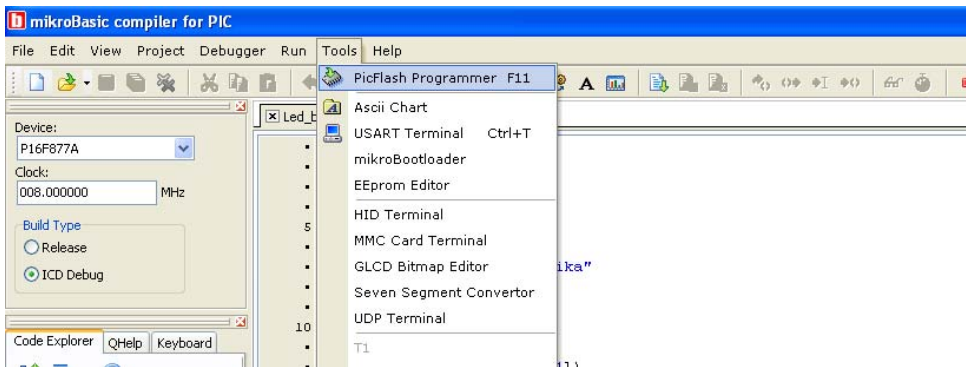
STEP 03:
Compiling example program

Now it's time to compile our example program. Press **CTRL+F9** or select **Project > Build** from the drop-down menu.



STEP 04:
Writing example program to MCU

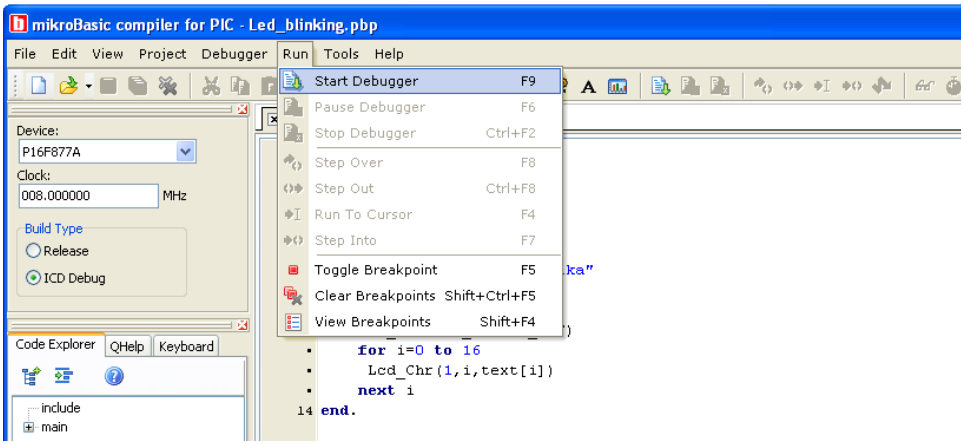
After successful compilation of our example program it's time to write program to PIC microcontroller. You can do that by pressing **F11** or by selecting **Tools > PicFlash Programmer** from the drop-down menu.



After pressing **F11** or by selecting **Tools > PicFlash Programmer** from the drop-down menu, the PicFLASH 2 Programmer software should appear and automatically program PIC microcontroller.

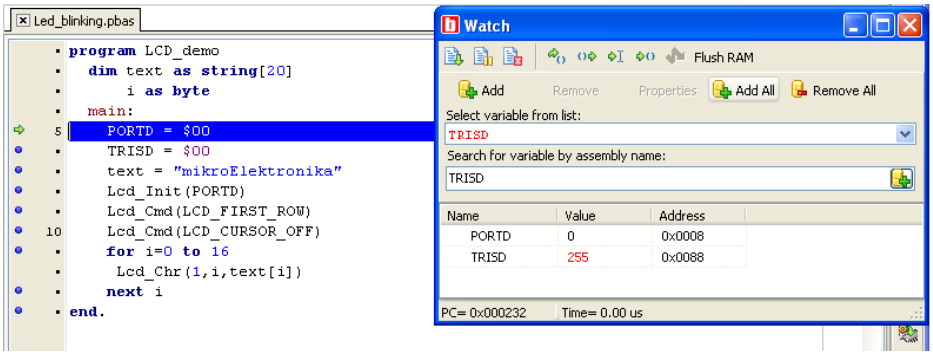
STEP 05:
Running mikroICD Debugger

You can run the mikroICD by selecting **Run › Start Debugger** from the drop-down menu, or by clicking the Debug Icon.



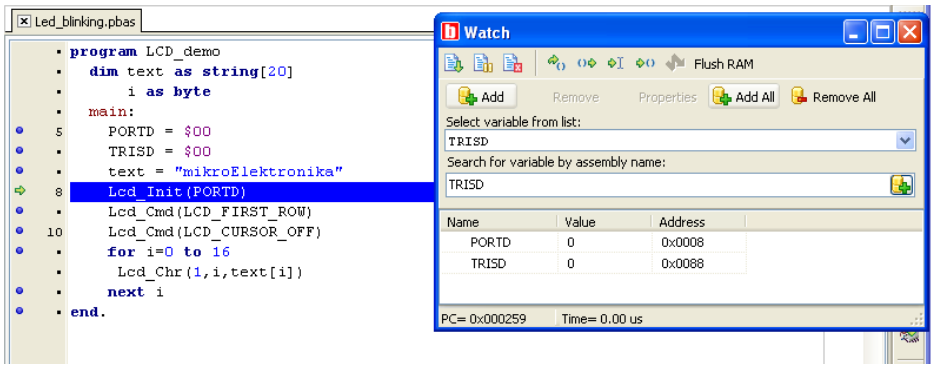
STEP 06:
Executing code line by line

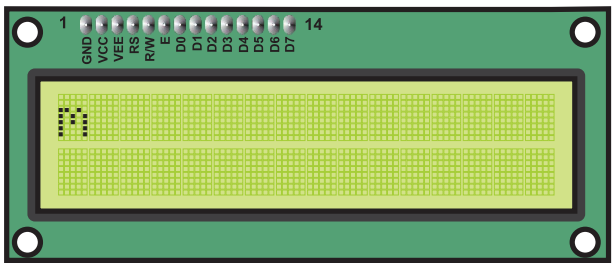
We will debug program line by line. Pressing **F8** we are executing code line by line.



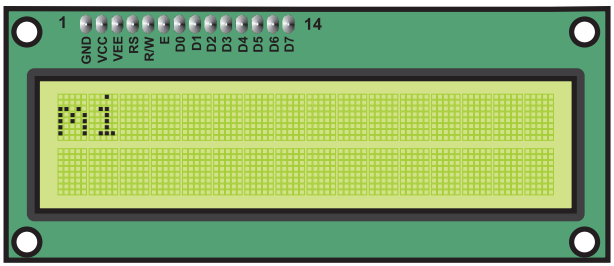
It is recommended that user does not use Step Into [F7] and Step Over [F8] over Delays routines and routines containing delays. Instead use Run to cursor [F4] and Breakpoints functions. Stepping over delays can take too long.

All changes are read from PIC and loaded into Watch Window. Note that **TRISD** changed its value from 255 to 0.

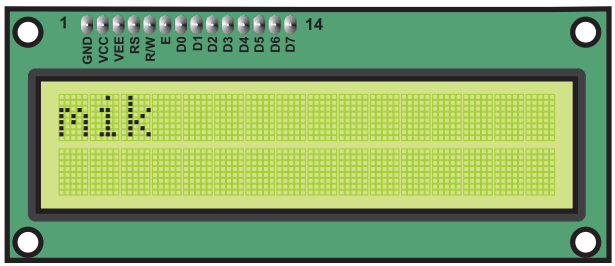




After LCD initialization, you have reached loop for writing characters on LCD. After pressing [**F8**] (Step Over) on `Lcd_Chr(1,i,text[i-1])` function, "m" will be written on LCD.



If you press [**F8**] (Step Over) again, letter "i" will be written on LCD just after letter "m". Note that writing letters step by step takes some time. Now you got "mi" on your LCD.

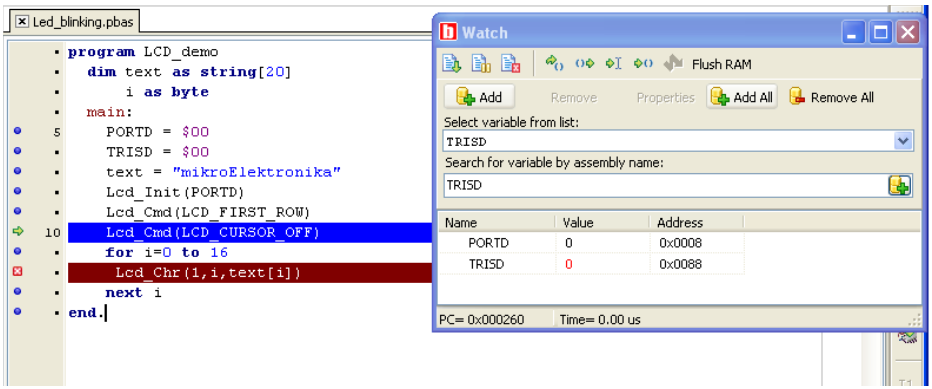


We have reached the third cycle in for loop. Now, if we press [**F8**] (Step Over) again , the letter "k" will appear on LCD just after "mik". Now "mik" is written on LCD. If you continue pressing [**F8**] (Step Over) you should reach the end of if loop, as well as end of program. The word "mikroElektronika" should be written on your LCD.

mikro ICD Debugger Options

Executing code in Real-Time Mode

Step Into [**F7**] and Step Over [**F8**] are mikroICD debugger functions that are used in stepping mode. There is also Real-Time mode supported by mikroICD. Functions that are used in Real-Time mode are Run/ Pause Debugger [**F6**] and Run to cursor [**F4**]. Pressing **F4** goes to the line selected by user. User just has to select line with cursor and press **F4**, and program will be executed until the selected line is reached.



Breakpoints have been separated into two groups. There are hardware and software break points. Hardware breakpoints are placed in PIC and they provide fast debug. Number of hardware breakpoints is limited (1 for P16 and up to 3 for P18). If all hardware brekpoints are used, new breakpoints that will be used as software breakpoints. Those breakpoints are placed inside mikroICD software, and they simulate hardware breakpoints. Software breakpoints are much slower then hardware breakpoints, due to greater number of sw breakpoints.

OVERVIEW:

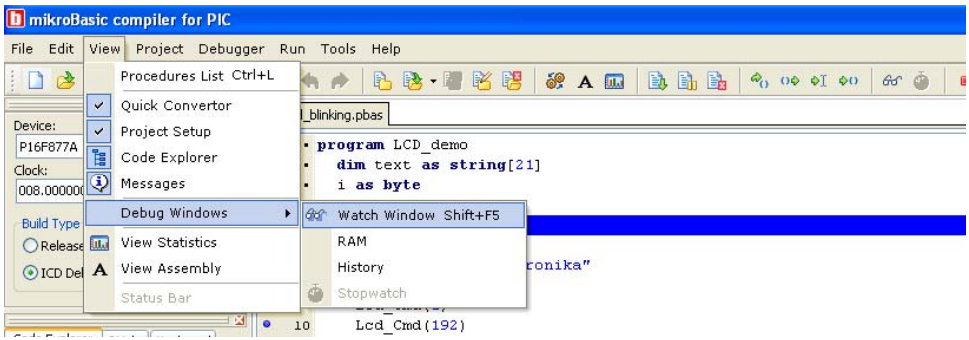
Usage and explanation of breakpoints

Run(Pause) Debugger [**F6**] and Toggle Breakpoints [**F5**] are mikroICD debugger functions that are used in Real-Time mode. Pressing **F5** marks line selected by user for breakpoint. **F6** executes code until a breakpoint is reached. After reaching breakpoint, debugger halts. With our example we will use breakpoints for writing "mikroElektronika" on LCD char by char. A breakpoint is set on LCD_Chr command and program will stop everytime this function is reached. After reaching a breakpoint we must press **F6** again for continuing program execution.

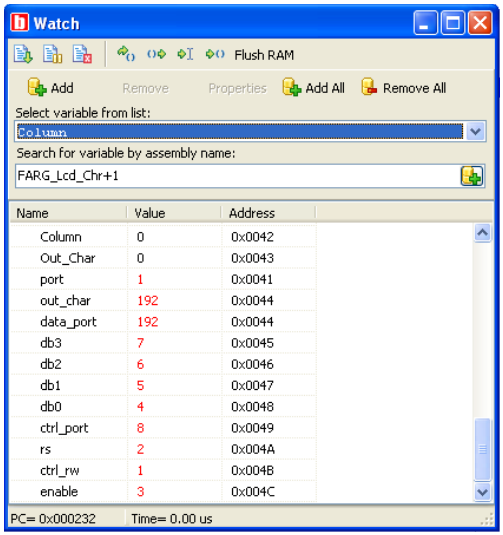
The differences between hardware and software breakpoints are not visible in mikroICD software but their different timings are quite notable, so it is important to know that there are two types of breakpoints.

Watch Window

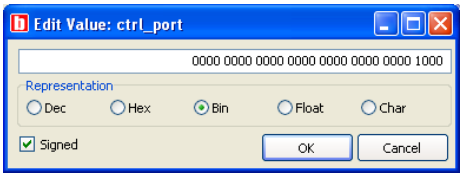
Debugger Watch Window is the main debugger window which allows you to monitor program items while running your program. To show the Watch Window, select **View › Debug Windows › Watch Window** from the drop-down menu.



The Watch Window displays variables and registers of PIC, with their addresses and values. Values are updated as you go through the simulation. Use the drop-down combo box to add and remove the items that you want to monitor. Recently changed items are colored red.



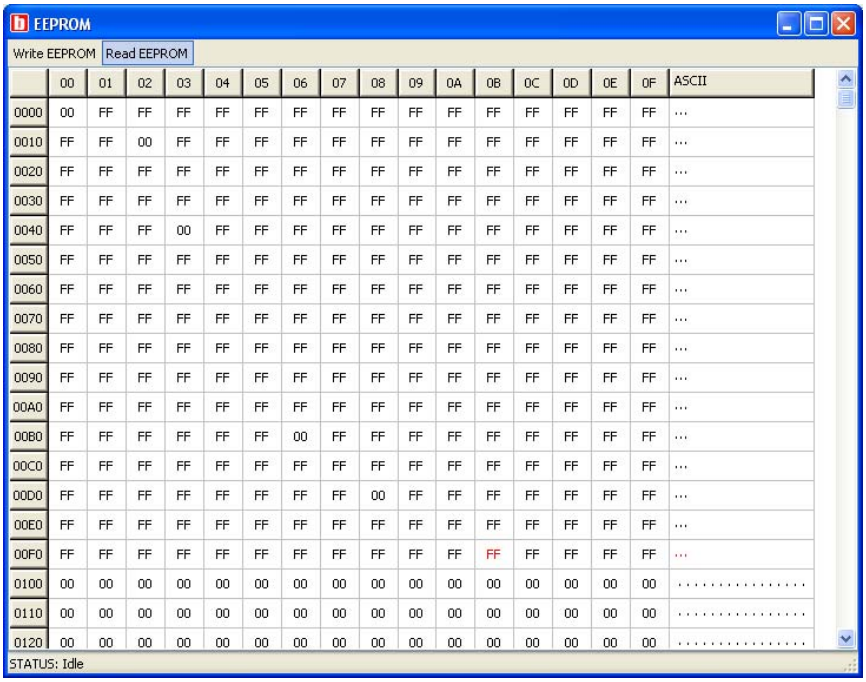
Double clicking an item opens the Edit Value window in which you can assign a new value to the selected variable/register. Also, you can change view to binary, hex, char, or decimal for the selected item.



EEPROM Window

mikroICD EEPROM Window is available from the drop-down menu, **View › Debug Windows › View EEPROM**.

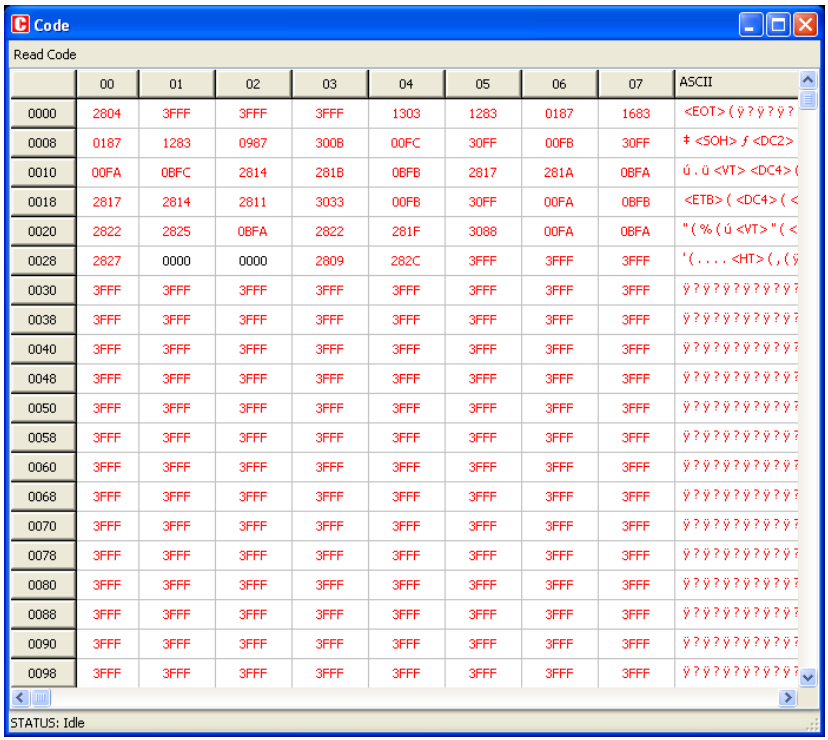
The EEPROM window shows current values written into PIC internal EEPROM memory. There are two action buttons concerning EEPROM watch window - **Flush EEPROM** and **Read EEPROM**. **Flush EEPROM** writes data from EEPROM window into PIC internal EEPROM memory. **Read EEPROM** reads data from PIC internal EEPROM memory and loads it up in EEPROM window.



View Code Window

mikroICD View Code Window is available from the drop-down menu, **View › Debug Windows › View Code**.

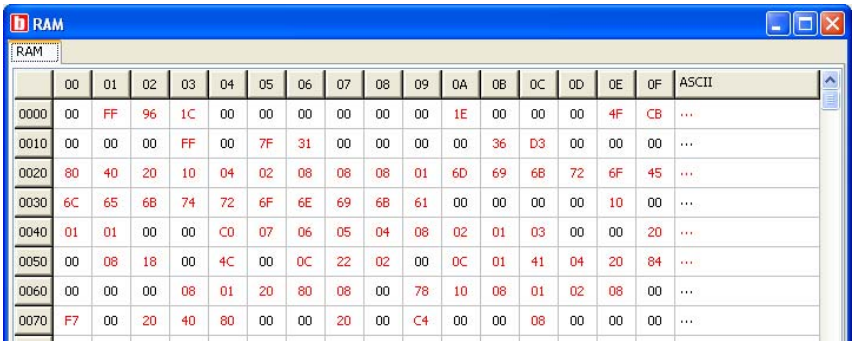
The View Code window shows code (hex code) written into PIC. There is action button concerning View Code watch window - **Read Code**. **Read Code** reads code from PIC and loads it up in View Code Window.


Code
Read Code
00 01 02 03 04 05 06 07 ASCII
0000 2804 3FFF 3FFF 3FFF 1303 1283 0187 1683
0008 0187 1283 0987 300B 00FC 30FF 00FB 30FF
0010 00FA 0BFC 2814 281B 0BFB 2817 281A 0BFA
0018 2817 2814 2811 3033 00FB 30FF 00FA 0BFB
0020 2822 2825 0BFA 2822 281F 3088 00FA 0BFA
0028 2827 0000 0000 2809 282C 3FFF 3FFF 3FFF
0030 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0038 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0040 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0048 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0050 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0058 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0060 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0068 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0070 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0078 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0080 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0088 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0090 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
0098 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF 3FFF
STATUS: Idle

View RAM Window

Debugger View RAM Window is available from the drop-down menu, **View › Debug Windows › View RAM**.

The View RAM Window displays the map of PIC's RAM, with recently changed items colored red.



	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	ASCII
0000	00	FF	96	1C	00	00	00	00	00	00	1E	00	00	00	4F	CB	···
0010	00	00	00	FF	00	7F	31	00	00	00	00	36	D3	00	00	00	···
0020	80	40	20	10	04	02	08	08	08	01	6D	69	6B	72	6F	45	···
0030	6C	65	6B	74	72	6F	6E	69	6B	61	00	00	00	00	10	00	···
0040	01	01	00	00	C0	07	06	05	04	08	02	01	03	00	00	20	···
0050	00	08	18	00	4C	00	0C	22	02	00	0C	01	41	04	20	84	···
0060	00	00	00	08	01	20	80	08	00	78	10	08	01	02	08	00	···
0070	F7	00	20	40	80	00	00	20	00	C4	00	00	08	00	00	00	···

Common Errors

- Trying to program PIC while mikroICD is active. Press "Stop Debugger" to solve.
- Trying to debug with mikroICD **Release** build Type version of program.
- Trying to debug changed program code which hasn't been compiled and programmed into PIC.
- Trying to select line that is empty for Run to cursor [**F4**] and Toggle Breakpoints [**F5**] functions.

If you are experiencing problems with any of our products or you just want additional information, please let us know. We are committed to meet every your need.

Technical Support :
support@mikroe.com

If you have any other question, comment or a business proposal, please contact us:

E-mail: ***office@mikroe.com***
Web: ***www.mikroe.com***
Forum: ***www.mikroe.com/forum/***